June 6, 1994

FISH SCREEN ACTION PLAN

The decision to develop a fish screen action plan was reached at the May 3, 1993 meeting. Present at the meeting were Al Petrovich (Deputy Director, Fisheries), Tim Farley (Chief, Inland Fisheries Division), Forrest Reynolds and Gene Fleming (Assistant Chiefs, Inland Fisheries Division), Dan Odenweller and Deborah McKee (Inland Fisheries Division), Pete Chadwick (Chief, Bay Delta and Special Water Projects Division), Ryan Broddrick (Regional Manager, Region 2), Paul Ward (Region 2), Dick Daniels (Environmental Services Division), and Craig Manson (Chief Counsel).

The decision was reached after a series of issues were brought to the attention of the Department of Fish and Game (Department). These issues included activities at the Glenn-Colusa Irrigation District intake, private diversions in the Suisun Marsh, Department-owned diversions in the critical habitat of both the winter run chinook salmon and the Delta smelt, and agricultural diversions both on the Sacramento River and in the Sacramento-San Joaquin Delta. These issues had as a common thread the need for a coordinated approach to fish screening issues by the staff of the Department.

Subsequent to this meeting, a decision was reached to ask the Office of the Attorney General for an updated "Memorandum of Law" on the subject of fish screening. This "Memorandum of Law" will address concerns over the relative priorities between the older Fish and Game Code sections related to fish screening and the more recent California Endangered Species Act (attached memorandum from Petrovich to Manson dated May 26, 1993).

The group made several decisions on the approach to be followed, which are repeated here. First, the consensus of the group was that the Department needed to deal with its own water diversions immediately, to avoid being placed in the position of asking others to do that which we had not addressed. We then decided that in light of the language in the Fish and Game Code, our priority order for dealing with these diversions would be as follows:

- First, diversions of 250 cfs of more capacity,
- Then diversions of less than 250 cfs capacity.
- Diversions in the critical habitat of winter run chinook salmon would take precedence over all other diversions (the intent may have been to deal with diversions in the State "Essential Habitat" or the Federal "Critical Habitat" of listed species).
- Finally, diversions which affected anadromous salmonids would take precedence over other diversions affecting resident fishes.

A subsequent meeting was held on November 22, 1993, to discuss the proposed Department screen policy. Present were Boyd Gibbons (Director), Al Petrovich (Deputy Director, Fisheries), Tim Farley (Chief, Inland Fisheries Division) and Dan Odenweller (Inland Fisheries Division). At that meeting the Director requested that the priority system be revised to make the plan "resource driven." As a result, listed species considerations (diversions located within the "Critical Habitat" of a listed species) were placed ahead of large diversions located outside of these areas.

The proposed Department screen policy (transmitted in a memorandum from Tim Farley to Boyd Gibbons was approved on March 9, 1994.

PROBLEM STATEMENT

The following is a preliminary listing of diversions within the State of California, by Region, at least some of which require attention. We have listed the diversions within the general categories outlined earlier. This listing is not complete due to both the lack of information on diversions within the State and a lack of certainty over their impact on fishery resources. We are in the process of identifying and locating diversions, and they will be added to the listing as the information is generated.

PRIORITY ONE - Diversions Located Within the Critical Habitat of a Federally Listed Species or the Essential Habitat of a State Listed Species.

Diversions serving lands owned and/or operated by the Department

- Diversions owned and operated by the Department

  Region 1

  - Battle Creek Wildlife Area - A 100 cfs diversion from Battle Creek with a Department installed and operated fish screen.

  Region 2

  - Yolo Bypass Wildlife Area (Proposed) - An unscreened 100 cfs diversion from Tule canal/toe drain, connected to the tidal waters of Cache Slough.

  - Upper Butte Basin Wildlife Area

    Little Dry Creek Unit (Butte County) - This unit has an unscreened 35 cfs diversion from Butte Creek. In addition, an overland supply of water from the 100 Drain and from the Feather River (Oroville Dam) is currently available.

    Howard Slough Unit (Glenn County) - Water is obtained from Western Canal and from 10 unscreened diversions off of the Howard Slough system adjacent to Butte Creek (approximately 50 cfs). Two fish screens, one on each of the two Howard Slough openings off Butte Creek will be needed to resolve this situation.

    Llano Seco Unit - Water is obtained from several sources. The Department owns unscreened diversions from Little Chico Creek and Angel Slough. In addition, we obtain water from both M&T Pumps on Big Chico Creek and from the Parrot-Phelan diversion on Butte Creek (these will be addressed below).

  - Woodbridge Ecological Reserve (San Joaquin County)

    North Unit - Two unscreened diversions from Hog Slough (Delta).

    South Unit - An unscreened diversion from Sycamore Slough (Delta).

- Vernalis Riparian Corridor (San Joaquin County) - Two 12-inch siphons from the San Joaquin River near Vernalis, located on the east bank of the river.

- Calhoun Cut Ecological Reserve (Solano County) - An unscreened diversion from Calhoun Cut (Delta) which is currently unused. Current plans call for activation of the pump to provide for native plant production.

Region 3

- Grizzly Island Wildlife Area

  Grizzly Island Unit

  a) Grizzly Island Ditch - Two 48-inch pipes which are currently unscreened. This project will be screened as part of a "4-Pumps Fund" and Department of Water Resources (DWR) effort.

  b) Montezuma Slough - Five 36-inch unscreened diversions with a capacity of 50 to 75 cfs each.

  Crescent Unit

  a) Grizzly Bay - One 36-inch unscreened intake into King Cut from Grizzly Bay.

  b) Montezuma Slough - Three 36-inch gates from Tree Slough with a direct connection to Montezuma Slough. There are also two 36-inch drains at this location.

  Island Slough Unit - Two 36-inch unscreened diversions from Montezuma Slough. These two diversions are being screened as part of the development of this property.

  Joice Island Unit

  a) Cut Off Slough - One unscreened 48-inch intake. Slough connects directly to Montezuma Slough.

  b) Montezuma Slough - Three unscreened 48-inch intakes.

  c) Suisun Slough - Three 36-inch drains into this slough.

  Gold Hills Unit - Two unscreened 36-inch intakes from an unnamed slough which connects to Cordelia Slough.

  Cordelia Slough Unit - Four unscreened 36-inch diversions from Cordelia Slough.

Goodyear Slough Unit

a) Suisun Bay - One unscreened 36-inch intake and two-36 inch drains.

b) Goodyear Slough - Four unscreened 36-inch intakes and one 36-inch drain.

- Hill Slough Wildlife Area

  Suisun Slough - One unscreened 36-inch intake and one 36-inch drain.

  Hill Slough

  a) Hill Slough - One unscreened 36-inch intake and one 36-inch drain.

  b) McCoy Creek - Three unscreened 36-inch intakes.

- Napa-Sonoma Marsh

  Fly Bay - Two 36-inch gates without fish screens.

  Huichica Creek - One 36-inch unscreened intake and one 36-inch outlet structure.

  Ringstrom Bay - Two 36-inch unscreened intake structures.

- Petaluma Marsh

  Day Island - One 48-inch intake without fish screens.

  Green Point Unit - One 36-inch unscreened intake with a non-functional gate. Open all year round.

Region 4

Region 5

- Private diversions serving lands owned and operated by Department

Region 1

Region 2

- M&T Pumps on Big Chico Creek - This unscreened diversion, located near Chico, feeds the "Llano Seco" properties and causes reverse flows from the Sacramento River up Big Chico Creek in the drier months. We believe that a relocation of this diversion to the Sacramento River, with fish screens and a change in the point of diversion is the most appropriate solution to this diversion.

- Parrot Phelan Diversion on Butte Creek - This diversion is located near Chico, and is currently unscreened. The diversion was once screened by the Department, and is in the process of being screened again by the Department, with the assistance of the other water users. Completion of the screen is anticipated by the fall of 1994.

Region 3

- Grizzly Island Wildlife Area, Roaring River Slough - Eight 60-inch siphons taking water from Montezuma Slough. This diversion site is equipped with fish screens installed and operated by the DWR as part of the Plan of Protection for the Suisun Marsh. The fish screens do not meet the current Department Screen Criteria.

Region 4

Region 5

Diversions Larger Than 250 CFS Capacity.

Region 1

- Anderson Cottonwood Irrigation District (ACID) (Main Canal) diversion, located in Redding. Capacity 400 cfs. Screen constructed and operated by the Department.

Region 2

- Glenn-Colusa Irrigation District diversion, located near Hamilton City. Capacity is 3000 cfs.
- Reclamation District 108 diversion, located near Grimes. Capacity is 800 cfs.
- Sutter Mutual Water Company diversions located near Meridian. Capacity is 720 cfs.
- Natomas Central Mutual Water Company diversions, located near Sacramento. Capacity is 335 cfs.
- Provident Irrigation District diversions, located near Princeton. Capacity is 300 cfs.
- Reclamation District 1004 diversions, located near Colusa. Capacity is 300 cfs.
- Reclamation District 108 - Tyndall Mound diversion, located near Knight's Landing. Capacity is 275 cfs.

Region 3

Region 4

Region 5

Diversions of 250 cfs or less capacity.

Region 1

- ACID (Bonneyview Pumps) diversion, located in Redding. Capacity 80 cfs. Screened in 1992 but has not been evaluated.

Region 2

- Conaway Conservancy Group diversions, located near Bryte. Three intakes with a capacity of 300 cfs.
- City of Sacramento - Sacramento River intake with approximately 200 cfs capacity.
- Reclamation District 108 - Boyer's Bend diversion, located near Knight's Landing. Capacity is 130 cfs.
- Reclamation District 108 - Howell's Landing diversion, located near Knight's Landing. Capacity is 71 cfs.
- Maxwell Irrigation District diversion, located near Princeton. Capacity 80 cfs. Screening currently in progress for their new, relocated pumping station.
- Princeton-Codora-Glenn Irrigation District diversions, located near Princeton. Two diversion sites, each with a capacity of 120 cfs.
- Surveys of the Sacramento River between the mouth of the American River and the mouth of the Feather River identified 58 diversions. All of the diversions are unscreened, some may be addressed individually elsewhere in this document.
- Surveys of the Sacramento River between the mouth of the American River and the Delta Cross-channel identified 316 diversions. All of the diversions are unscreened.
- Surveys of islands in the Sacramento-San Joaquin Delta identified the following diversions:
    - Venice Island - 24 diversions
    - MacDonald Island - 43 diversions
    - Twitchell Island - 21 diversions
    - Bacon Island - 34 diversions

Region 3

- Joice Island Gun Club, Suisun Marsh (Ownership 424) - One 36-inch and two 48-inch unscreened gates from Montezuma Slough.

- California Farms, Suisun Marsh (Ownership 425) - One 36-inch unscreened gate from Montezuma Slough.
- Tip End Gun Club, Suisun Marsh (Ownership 426) - One 36-inch unscreened gate from Montezuma Slough.
- The Island Club, Suisun Marsh (Ownership 501) - Two 36-inch unscreened gates from Montezuma Slough.
- Grizzly Duck Club, Suisun Marsh (Ownership 502) - Two 36-inch unscreened gates from Montezuma Slough.
- Gum Tree Farm, Suisun Marsh (Ownership 504) - One 48-inch unscreened gate from Montezuma Slough.
- Payton Place, Suisun Marsh (Ownership 505) - One 30-inch and one 36-inch unscreened gate from Montezuma Slough.
- Four Winds D. C., Suisun Marsh (Ownership 506) - One 30-inch unscreened gate from Montezuma Slough.
- The Slough Farms, Suisun Marsh (Ownership 514) - One 24-inch unscreened gate from Montezuma Slough.
- Grizzly Ranch, Suisun Marsh (Ownership 520) - Two 24-inch unscreened gates from Montezuma Slough.
- Piedmont Rod & Gun, Suisun Marsh (Ownership 523) - One 36-inch unscreened gate from Montezuma Slough.
- Balboa Farms, Suisun Marsh (Ownership 525) - One 36-inch unscreened gate from Montezuma Slough.
- Can-Can Duck Club, Suisun Marsh (Ownership 526) - One 30-inch and two 36- inch unscreened diversions from Montezuma Slough.
- Delta King Ranch, Suisun Marsh (Ownership 527) - One 24-inch unscreened gate from Montezuma Slough.
- Can-Can Duck Club, Suisun Marsh (Ownership 601) - Two 36-inch unscreened gates from Montezuma Slough.
- Duck-A-Go-Go, Suisun Marsh (Ownership 607) - One 24-inch unscreened gate from Montezuma Slough.
- Shurshot gun Club, Suisun Marsh (Ownership 608) - One 30-inch unscreened gate from Montezuma Slough.

- Black Dog Gun Club, Suisun Marsh (Ownership 609) - One 36-inch unscreened gate from Montezuma Slough.

- Westwind Duck Club, Suisun Marsh (Ownership 610) - Two 24-inch and four 36-inch unscreened gates from Montezuma Slough.

- Hidden Cove, Suisun Marsh (Ownership 618) - One 30-inch and two 36-inch unscreened gates from Montezuma Slough.

- Meridian Gun Club, Suisun Marsh (Ownership 612) - Two 36-inch unscreened gates from Montezuma Slough.

- Pintail Ranch, Suisun Marsh (Ownership 625) - Five 36-inch and two 24-inch unscreened gates from Montezuma Slough.

- Meins Landing, Suisun Marsh (Ownership 631) - One 24-inch and one 30-inch unscreened gate from Montezuma Slough.

- Montezuma Ranch, Suisun Marsh (Ownership 908) - Two 36-inch unscreened gates from Montezuma Slough.

- Hook n' Trigger, Suisun Marsh (Ownership 913) - Two 36-inch unscreened gates from Montezuma Slough.

- Concord Farms, Suisun Marsh (Ownership 932) - One 48-inch unscreened gate from Montezuma Slough.

- Spinner Island, Suisun Marsh (Ownership 940)- One 24-inch unscreened gate from Montezuma Slough.

- Balboa Farms, Suisun Marsh (Ownership 525) - One 12-inch unscreened diversion from Montezuma Slough.

- Hidden Cove, Suisun Marsh (Ownership 618) - One 18-inch unscreened gate from Montezuma Slough.

Region 4

Region 5

PRIORITY TWO - Diversions Located Within the Habitat of Salmon, Steelhead, and Anadromous Fishes.

Diversions serving lands owned and/or operated by the Department.

- Diversions owned and operated by the Department

Region 1

Region 2

- Nelson Slough Diversion from the Feather River. One 40 cfs diversion serving our property with a privately owned pump of similar size on the same slough.

Region 3

Region 4

Region 5

- Private diversions serving lands owned and operated by the Department

Region 1

Region 2

Region 3

Region 4

Region 5

Privately Owned Diversions Larger Than 250 CFS Capacity

Region 1

Region 2

- Woodbridge Irrigation District diversion on the Mokelumne River near Woodbridge. Capacity 400 cfs (although a maximum diversion of 480 cfs has been recorded). Current Department fish screen needs to be replaced.

Region 3

Region 4

- West Stanislaus Irrigation District on the San Joaquin River near Grayson. One diversion with a maximum capacity of 400 cfs which was screened by the Department but abandoned in 1977.

Region 5

Privately Owned Diversions of 250 CFS Or Less Capacity

Region 1

Region 2

- City of Sacramento - American River intake near the C.S.U. Sacramento campus.
- North San Joaquin Water Conservation District on the Mokelumne River above the Woodbridge Irrigation District diversion. Two diversions, each of about 30 cfs in the vicinity of Clements.
- Stockton East Water District on the Calaveras River at the Bellota Weir. One diversion structure with two intakes which is currently unscreened.
- Reclamation District 2095 diversion on the San Joaquin River near Manteca. One diversion in an old oxbow off the San Joaquin River, which is unscreened.

Region 3

Region 4

- Banta-Carbona Irrigation District intake on the San Joaquin River near Tracy. One diversion of about 220 cfs which was screened by the Department but abandoned in 1977.
- El Solyo Irrigation District on the San Joaquin River near Westley. One diversion of about 50 cfs which was screened by the Department but abandoned in 1977.
- Patterson Irrigation District on the San Joaquin River near Patterson. One diversion of about 150 cfs which was screened by the Department but abandoned in 1977.
- Merced River (Crocker Huffman Dam to the confluence with the San Joaquin River). Staff have identified 69 diversions on this river reach, of which most are either unscreened or which have screens which either need to be replaced, or do not meet our current criteria.
- Tuolumne River (Old La Grange Road Bridge to the confluence with the San Joaquin River). Staff have identified 34 diversions on this river reach. None of the diversions were reported as screened.
- Stanislaus River (Knights Ferry to the confluence with the San Joaquin River). Staff have identified 38 diversions in this river reach. None of the diversions were reported as screened.

Region 5

PRIORITY THREE - Diversions In Other Inland Waters of the State

Region 1

- Lake Earl Wildlife Area - No input provided at this time.
- Eel River Wildlife Area - No fish screen, water source is from unnamed springs and winter rain runoff.

- Fay Slough Wildlife Area - No fish screen, winter rain runoff.
- Tehama Wildlife Area - A 5 cfs diversion from Plum Creek with a Department installed and operated fish screen.
- Shasta Valley Wildlife Area - An unscreened 45 cfs diversion from the Little Shasta River.
- Willow Creek Wildlife Area - Nine unscreened diversions from Willow Creek.
- Honey Lake Wildlife Area - Diversions from the Susan River.
- Butte Valley Wildlife Area - An unscreened perimeter canal diverting about 120 cfs of water from Tres, Harris, Muskgrave, and Prather creeks.
- Ash Creek Wildlife Area - A 48 cfs diversion from Ash Creek.

Region 2

- Spenceville Wildlife Area (Nevada and Yuba counties) - Water is obtained from the Nevada Irrigation District through up to four unscreened diversions from Cox Creek and Little Dry Creek.
- Oroville Wildlife Area (Butte County) - An unscreened diversion from Thermalito Afterbay to supply water to plantings.

Region 3

- Elkhorn Slough Ecological Reserve - Not included in the original submission, may not be a problem.

Region 4

- San Joaquin Hatchery - An unscreened 35 cfs intake from Millerton Lake at Friant Dam. There is a power generator on the supply line, and a fish screen may be unnecessary.
- Moccasin Creek Hatchery - An unscreened 30 cfs intake from Moccasin Reservoir at Moccasin Creek Dam. There is a power generator on the supply line, and a fish screen may be unnecessary.

Region 5

PRIORITY FOUR - Other Diversions in Coastal Waters of the State.

Region 1

Region 3

Region 5

COST CONSIDERATIONS

We have some basis for estimating costs for fish screens in various situations. The following section will provide a general overview of the subject, but we must caution that each situation is unique and must be addressed individually.

Fish Screening Cost Assumptions

Through our recent experience with fish screening projects in California, we have developed the following system for estimating costs. The cost basis will vary depending on the size of the diversion and the complexity of the fish screen system.

We have three general categories which are:

- Small diversions (15 cfs or less) - These small diversions, generally located on the bank of the river or stream, can be screened for about $2,000 per cfs. This assumes that only minor civil works may be needed, and that power and other supporting services are available at the site.

We have installed a fish screen on a siphon on MacDonald Island located in the Sacramento-San Joaquin Delta for about the same cost except that for providing the power to run the screen cleaning mechanism.

- Medium-sized diversions (15 - 250 cfs) - These diversions, which require moderate civil works to support the screens, but which are located on the river and do not require extensive fish bypass facilities, can be screened for about $5,000 per cfs. Two examples of this are the ACID's Bonneyview Pumps fish screen and the City of West Sacramento fish screen.

A retrofit fish screen for existing culverts in the Suisun Marsh, on the Grizzly Island Wildlife Area has been estimated to cost about $2,000 per cfs, although we have not completed the facility at this time.

- Large and/or complex diversions - These diversions, which require both extensive civil works and complex bypass systems can cost as much as $10,000 per cfs to screen. Much depends on the specific situation. Recent examples include the Contra Costa Canal, Tehama-Colusa, and Glenn-Colusa fish screens.

The table lists some fish screen projects and either their cost to construct or the cost estimate in those cases where the screen has not been built. The date of the project is also provided to allow adjustment for inflation as needed.

RECENT FISH SCREENING PROJECTS, THEIR APPROXIMATE CAPACITY AND DATE OF THE COST ESTIMATE

Project	Capacity (cfs)	Total Cost	Cost per cfs
ACID (Bonneyview Pumps) - 1992	60	330,000	5,500
Contra Costa Canal - Estimate 1992	350	3,000,000	8,600
Los Vaqueros - Estimate 1992	250	500,000	2,000
MacDonald Island - 1992	12	25,000	2,100
USBR Tehama Colusa Canal - 1991	3,000	17,000,000	5,700
EBMUD Bixler Slough Intake - 1987	90	50,000	556
City of West Sacramento - 1985	45	45,000	1,000
DWR North Bay Aqueduct - 1987	180	250,000	1,400
DWR Roaring River - 1980	750	1,500,000	2,000
Glenn-Colusa Intake - 1990	3,000	30,000,000	10,000
Grizzly Island Ditch - 1993	150	300,000	2,000
Bacon Island - 1993	16	27,000	1,700
Maxwell Irrigation District - 1993	80	794,000	9,900
Pelger Mutual Water District - 1994	40	170,000	4,250

NOTES

The ACID, Los Vaqueros, MacDonald Island, EBMUD Bixler Slough, City of West Sacramento, and the two DWR installations do not include bypass facilities. The EBMUD Bixler Slough, the City of West Sacramento, and the DWR North Bay Aqueduct cost estimates are for the fish screen panels only.

The Contra Costa Canal, Glenn-Colusa, and USBR Tehama Colusa Canal fish screens require extensive bypass facilities.

The Grizzly Island Ditch fish screen project is a retrofit installation to existing culverts in the Suisun Marsh.